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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
KUMAR, VINOD	

ART UNIT	PAPER NUMBER
1638	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/523,362	CHARDONNENS ET AL.	
	Examiner	Art Unit	
	VINOD KUMAR	1638	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *22 November 2010*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,5,8-11,13,15,18,19,29,32,47,49 and 51-59* is/are pending in the application.

4a) Of the above claim(s) *55-59* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,5,8-11,13,15,18,19,29,32,47,49 and 51-54* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 May 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/22/2010 has been entered.

Status of Objections and Rejections

2. Claims 1, 5, 8-11, 13, 15, 18-19, 29, 32, 47, 49, 51-54 and newly added claims 55-59 are pending. Newly added claims 55-57 fall within the scope of the non-elected invention of Group XXXIII and are thus excluded from the present examination. Likewise, newly added claims 58-59 fall within the scope of the non-elected invention of Group XXXIV and are also excluded from the present examination. See Restriction Requirement mailed 10/03/2006. In view of this, newly added claims 55-59 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to nonelected inventions.

3. Claims 2-4, 6-7, 12, 14, 16-17, 20-28, 30-31, 33-46, 48 and 50 are previously cancelled. Accordingly, claims 1, 5, 8-11, 13, 15, 18-19, 29, 32, 47, 49 and 51-54 are examined on merits in the present Office action.

4. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 103

5. Claims 1, 5, 8-10, 13, 18-19, 29, 32, 47, 49 and 51-54 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Lanahan et al. (WIPO, PCT, WO 00/36126, Published 22 June 2000,

Applicant's IDS), and further in view of Gan (Biochem. Biophys. Res. Comm., 187:949-955, 1992), Grant et al. (Biochimica et Biophysica Acta, 1490:33-42, 2000) and Samuelsen et al. (Plant Physiol., 118:51-58, 1998) for the reasons of record stated in the Final Office action mailed 7/20/2010.

Lanahan et al. teach expressing a heat-stable thioredoxin protein (an oxidoreductase stress related protein). Furthermore, Lanham et al. also teach expressing microbial (includes yeast) heat-stable thioredoxin protein in transgenic plants. See for example, abstract; pages 1-2, 6-7, 11-13, 17, 20-31; examples 1-2; SEQ ID NOs: 1-7.

Gan teach a nucleic acid sequence encoding a yeast thioltransferase (also called glutaredoxin) having 100% identity to instant SEQ ID NO: 4.

Grant et al. teach that GRX1 and GRX2 (yeast glutaredoxins) are up-regulated by a range of stress conditions including oxidative, heat shock, osmotic (includes salinity) etc (pg 40, 3rd paragraph). Grant et al. also teach that yeast glutaredoxins are small heat-stable oxidoreductases which play an important role in protecting a cell exposed to environmental stresses. Environmental stress would include salt, drought including low temperature. Applicant's attention is directed to abstract, pages 33, 34; page 35, figure 1; page 36, figure 2; page 37, figure 3; page 38, figure 4; page 39, figure 5; pages 40-41.

Samuelsen et al. teach that yeast genes can be successfully expressed in plants to obtain expected phenotype and/or enzymatic activity associated with the yeast protein. See in particular, pg 51, abstract; pg 54, figures 1 and 2; pg 55, figure; pg 56, figures 4. The reference also cites additional prior art references to assert that expressing yeast genes in a plant tissue produces expected results (see page 51, right column, 3rd paragraph).

At the time the invention was made, it would have been prima facie obvious to one of ordinary skill in the art to modify the method of making a transgenic plant as taught by Lanahan et al., to

substitute the coding sequence encoding Lanahan et al. heat-stable thioredoxin protein with a recombinant DNA encoding Gan thioredoxin protein to obtain a transgenic plant and transgenic seed expressing Gan recombinant DNA.

It would have been thus obvious and within the scope of an ordinary skill in the art to over-express Gan glutaredoxin protein in any plant including monocot (maize) or dicot (tomato) plants of Lanahan et al. using any plant transformation method including the one taught by Lanahan et al.

Given that Grant et al. teach glutaredoxin protein (same protein as taught by Gan, emphasis added) are implicated in protecting a cell subjected to an environmental stress (oxidative or osmotic or salinity), one of ordinary skill in the art would have been motivated to over-express Gan nucleic acid sequence encoding glutaredoxin protein in any eukaryotic host cell including a plant cell to produce a transgenic plant cell which is regenerated into a stress-tolerant transgenic plant with a reasonable expectation of success.

Given, it was well known in the art at the time the instantly claimed invention was made that yeast genes can be overexpressed in a plant to produce an expected phenotype as asserted by Samuelsen et al., it would have been obvious and within the scope of an ordinary skill in the art to obviously try overexpressing Gan's oxidoreductase coding sequence in a plant for the purpose of obtaining environmental (salt, drought etc.) stress tolerant transgenic plant with a reasonable expectation of success.

It would have been obvious and within the scope of an ordinary skill in the art to use Gan nucleic acid sequence encoding the glutaredoxin protein as a DNA marker in any DNA hybridization based technique, such as Southern blot or DNA dot blot analysis to identify stress-tolerant transgenic plant with a reasonable expectation of success.

While one of ordinary skill in the art would have expressed Gan's nucleic acid sequence

encoding oxidoreductase protein in a plant using any method of plant transformation including the one taught by Lanahan et al., for the purpose of obtaining a transgenic plant with environmental (salt, drought etc.) stress tolerant characteristics as discussed above, it would have been obvious that said transgenic plant would have also exhibited any other characteristics including increased biomass, photosynthetic yield and/or dry matter production traits that are related to the property of Gan's oxidoreductase protein over-expression in said transgenic plant.

Thus, the claimed invention as a whole is prima facie obvious over the combined teachings of the prior art.

Response to Applicant's Arguments:

Applicant while admitting that Samuelson et al. do teach that overexpressing a yeast FE(III) reductase in tobacco plants produced the expected phenotype by increasing resistance to Fe-deficient conditions in said plants, however argues that two transformed lines (FRE1-A and FRE1-B) did not show enhanced Fe(III) reduction as expected. In view of this, Applicant argues that Samuelson et al. fails to show that a yeast gene when expressed does not produce predictable results (response, page 8, lines 3-19).

Applicant's arguments are not persusaive to suggest that Samuelson et al. teach that expression of a yeast gene in a plant produces unpredictable results.

It is maintained that it was well known in the art at the time the claimed invention was made that a yeast gene upon expression in plant would produce expected phenotype with a reasonable expectation of success. This is clearly evident from the teachings of Samuelsen et al.

Applicant's attention is drawn to page 56 (right column, lines 16-18 under discussion) of Samuelson et al., wherein the reference clearly teach that highest reduction activity was found in the transgenic line expressing FRE1 and FRE2 genes of yeast. Applicant's attention is also drawn to page

51, abstract; page 54, figures 1 and 2; page 55, figure 3; and page 56, figures 4 of Samuelsen et al. wherein the reference clearly teach that yeast genes can be successfully expressed in plants to obtain expected phenotype and/or enzymatic activity associated with the yeast protein. Furthermore, the reference also cites additional prior art references to assert that expressing yeast genes in a plant tissue produces expected results (see page 51, right column, 3rd paragraph).

It is not surprising and unexpected in any transgenic plant analysis that few plants fail to express the introduced trans gene due to gene silencing effects. That does not imply that Samuelsen et al. fail to demonstrate that a yeast gene can be successfully expressed in a plant transgenic environment to produce expected phenotype. It is important to note that majority of Samuelsen et al. transgenic plants produced the expected phenotype.

Applicant's attention is also drawn to Romero et al. (Planta, 201:293-297, 1997; see in particular, pg 293, abstract; pg 294, figures 1 and 2; pg 295, figure 3, table 1; pg 295, figures 4 and 5) who also teach drought tolerant transgenic tobacco plants expressing yeast trehalose-6-phosphate synthetase gene.

It is important to note that issue in the present obviousness analysis is whether there was any reason based on prior art teachings that would have motivated one of ordinary skill in the art to try expressing (obvious to try, emphasis added) Gan sequence in a plant to produce an abiotic stress tolerant transgenic plant. The answer to this question is obviously yes. As discussed above, one of ordinary skill in the art would have been obviously motivated to combine the teachings of Lanahan et al., Gan, Grant et al. and Samuelsen et al. to arrive at the claimed invention with a reasonable expectation of success.

Even Ritte's declaration filed under 37 CFR CFR § 1.132 clearly acknowledges that a skilled person might have recognized expression of yeast GRX2 gene in a plant would have increased tolerance to salinity, drought, and/or low temperature (see lines 4-7 of item 17 of the declaration).

It is important to note that obviousness does not require an absolute certainty of success but merely a reasonable expectation thereof, so long as the motivation or suggestion to combine the teaching of the cited references is known or disclosed in the prior art and is obvious to one skilled in the art and this is sufficient to establish a prima facie case of obviousness. In the instant case, one of ordinary skill in the art would have used teachings of the prior art as discussed above to arrive at the claimed invention with a reasonable expectation of success.

While it is known that yeast and plants are evolutionary divergent organisms, however it was well understood in the prior art that yeast genes can be successfully expressed in plants to obtain expected phenotype and/or enzymatic activity associated with the yeast protein. For example, Samuelsen et al. clearly points us in that direction as discussed above (see in particular, page 51, abstract; page 54, figures 1 and 2; page 55, figure; page 56, figures 4). Samuelsen et al. even cites additional prior art references to assert that expressing yeast genes in a plant tissue produces expected results (see page 51, right column, 3rd paragraph).

Given, Grant et al. clearly establishes the function of oxidoreductases (GRX1, GRX2) in abiotic stress response, it would have been obvious to try overexpressing any oxidoreductase, including yeast oxidoreducatse of Gan in a plant to arrive at the claimed invention with a reasonable expectation of success. Just to presume that expression of GRX proteins in a plant would have produced unexpected results because yeast and plants are evolutionary divergent organisms is insufficient to overcome the present obviousness analysis, particularly keeping in view that it was well

known in the prior art that it was routine to express yeast genes in plants to produce expected phenotype as asserted by Samuelsen et al.

In the absence of providing an experimental evidence to support the argument that yeast GRX protein(s) would not have produced expected results in plants, it is maintained that it would have been obvious and within the scope of an ordinary skill in the art to have arrived at the claimed invention with a reasonable expectation of success as discussed above.

Furthermore, given oxidoreductases (GRX1, GRX2) in yeast were implicated in abiotic stress response, it would have been an important motivation factor to try expressing said oxidoreductases in plants to produce abiotic stress tolerant plants, given the success of obtaining an expected phenotype upon expression of a yeast protein was well known in the art as asserted by Samuelsen et al.

It is further maintained that given Grant et al. teach glutaredoxin protein (same protein as taught by Gan, emphasis added) are implicated in protecting a cell subjected to an environmental stress (oxidative or osmotic or salinity), one of ordinary skill in the art would have been motivated to over-express Gan nucleic acid sequence encoding glutaredoxin protein in any eukaryotic host cell including a plant cell to produce a transgenic plant cell which is regenerated into a stress-tolerant transgenic plant with a reasonable expectation of success.

It is important to note that the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See In re Keller, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, one of ordinary skill in the art would have arrived at the claimed invention with a reasonable expectation of success by combing the teachings of cited art.

Applicant's argument to suggest increase in biomass production, photosynthetic yield, seed yield, and/or dry matter production in a transgenic plant overexpressing instant SEQ ID NO: 4 is not persuasive

It is maintained that Applicant has drawn incorrect comparisons between the teachings of Serrano et al. and/or Kasuga et al. (cited by Applicant in the response, see page 9) and present obviousness analysis. The protein TPS1 taught in Serrano et al., and DREB1A taught in Kasuga et al. are structurally unrelated proteins affecting different metabolic pathways and signal transduction signaling in plants compared to instantly claimed oxidoreductase. More importantly, it is property of Gan's oxidoreductase protein over-expression in a transgenic environment that would have produced any other characteristics besides abiotic stress tolerance. Neither Ritte's declaration nor the Applicant's arguments suggest that overexpression of a yeast oxidoreductase in a plant would have resulted in unexpected or surprising results.

It is also noted that Applicant is making incorrect comparison of Samuelson et al. teachings with the teachings of Serrano et al. and/or Kasuga et al. Samuelson et al., Romero et al. and other prior references cited in Samuelson et al. clearly establish the fact that expressing a yeast gene in a plant would have produced expected results.

It is therefore, maintained that the claimed invention as a whole is prima facie obvious over the combined teachings of the prior art.

6. Claims 11 and 15 remain rejected under 35 U.S.C. 103(a) as being unpatentable over Lanahan et al. (WIPO, PCT, WO 00/36126, Published 22 June 2000, Applicant's IDS), and further in view of Gan (Biochem. Biophys. Res. Comm., 187:949-955, 1992), Grant et al. (Biochimica et Biophysica Acta, 1490:33-42, 2000), Samuelsen et al. (Plant Physiol., 118:51-58, 1998) and Stomp et al. (Plant Physiol., 92:1226-1232, 1990) for the reasons of record stated in the Office action mailed 1/15/2010.

Applicant does not present any argument in the response filed 11/22/2010.

It is therefore, maintained that it would have been thus obvious and within the scope of an ordinary skill in the art to over-express Gan glutaredoxin protein in any plant cell or plant including a gymnosperm plant cell or plant using any plant transformation method including the one taught by Stomp et al. to arrive at the claimed invention with a reasonable expectation of success as discussed above.

Conclusions

7. Claims 1, 5, 8-11, 13, 15, 18-19, 29, 32, 47, 49 and 51-54 remain rejected.

All claims are drawn to the same invention claimed in the application prior to the entry of the submission under 37 CFR 1.114 and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the application prior to entry under 37 CFR 1.114. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action after the filing of a request for continued examination and the submission under 37 CFR 1.114. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vinod Kumar, Ph.D. whose telephone number is (571)272-4445. The examiner can normally be reached on 8.30 a.m. to 5.00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anne Marie Grunberg can be reached on (571) 272-0975. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Vinod Kumar/

Primary Examiner, Art Unit 1638